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(54) Photographic flash apparatus

(57) The flash exposure source 17, which is particularly suitable for use with wide angle objectives 11, has several lamps 15 mounted on an annular circuit board 14, a diffusely reflecting base surface 12, and optionally a diffusor 16. In use the source is mounted adjacent and concentric with the objective 11 on the side remote from the photosensitive film holder 21. The source produces a light intensity which reduces towards the centre of the source. The flash can be mounted on a rotatable disc which also carries filters 31—34, the selected filter on the flash being positionable adjacent the objective.

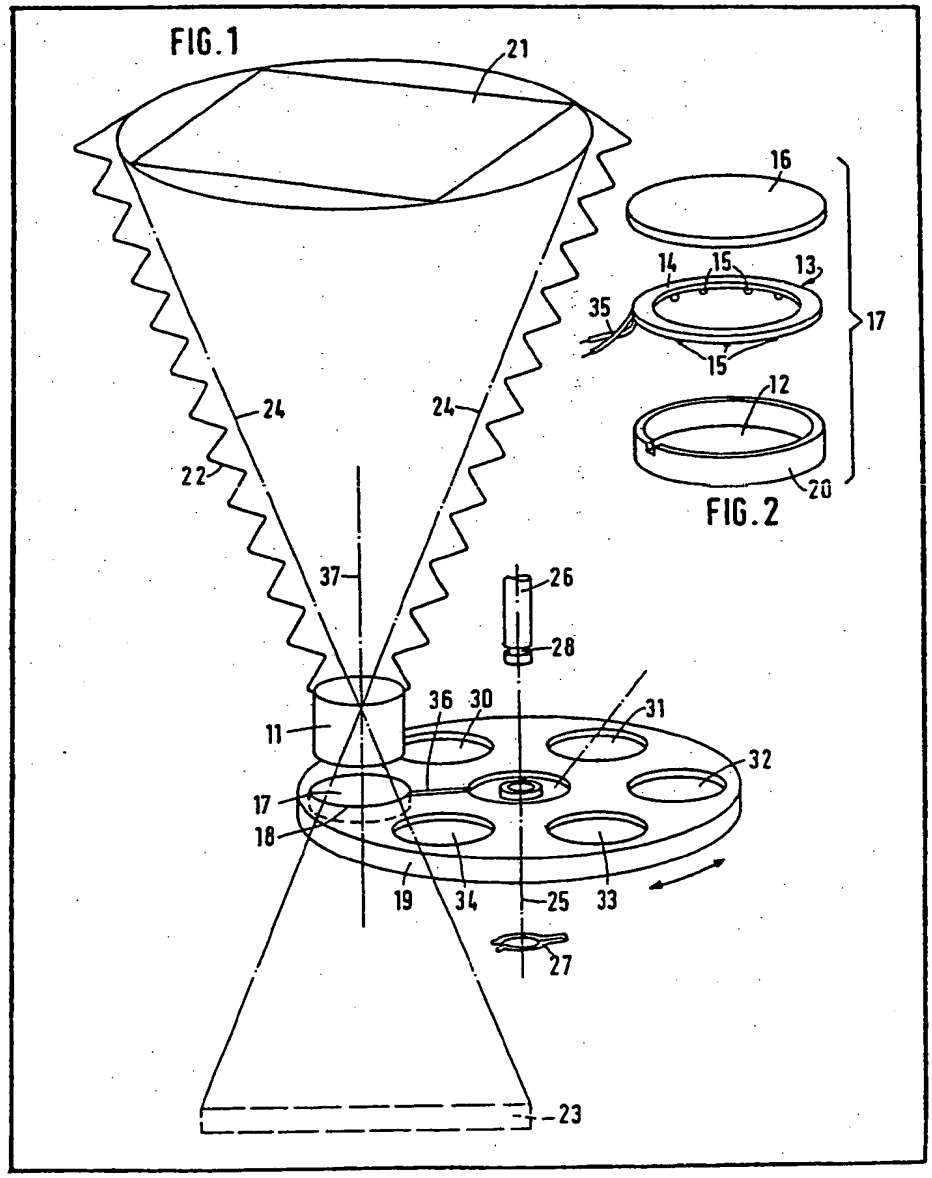

FIG.2

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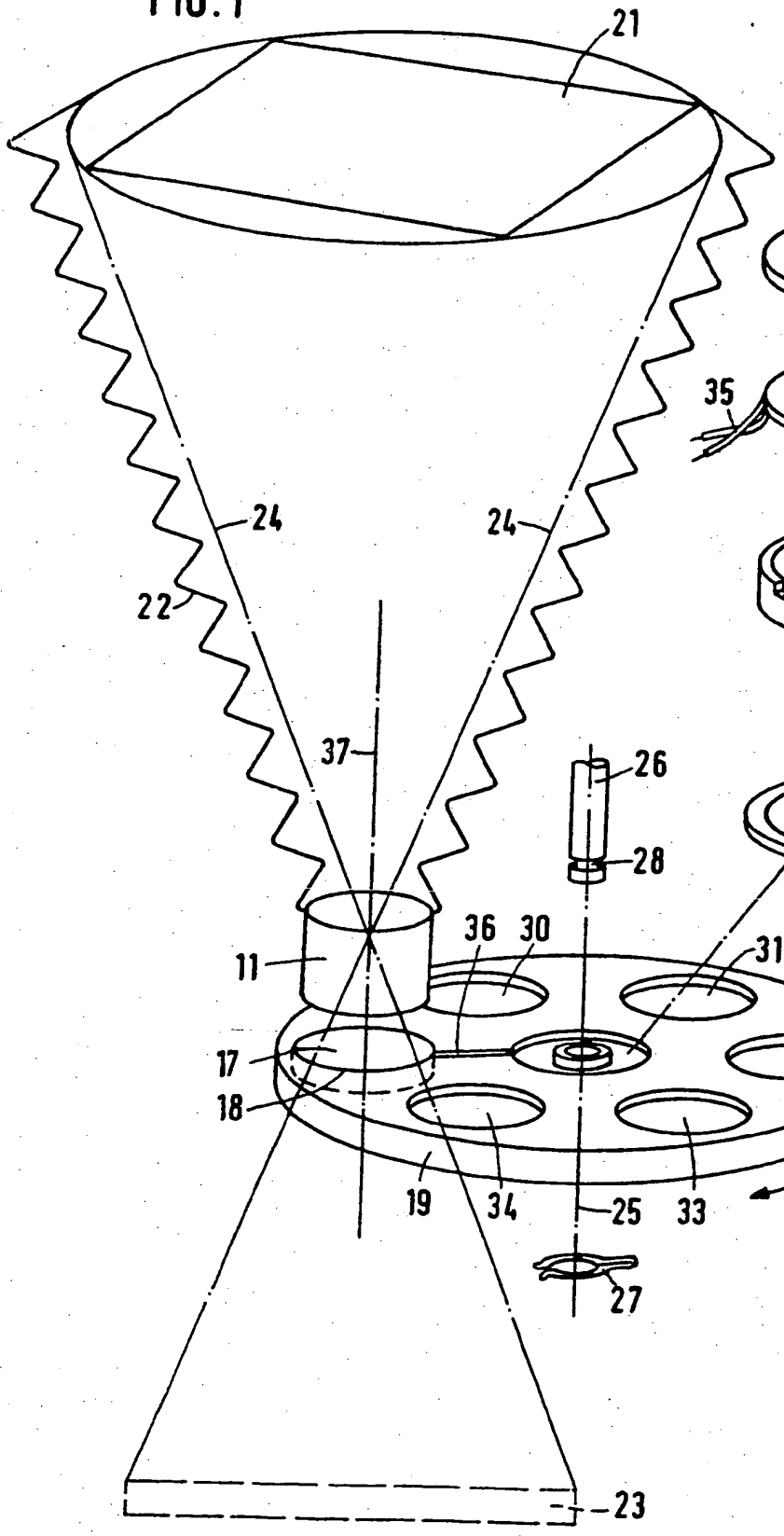
This print embodies corrections made under Section 117(1) of the Patents Act 1977.

FIG. 1



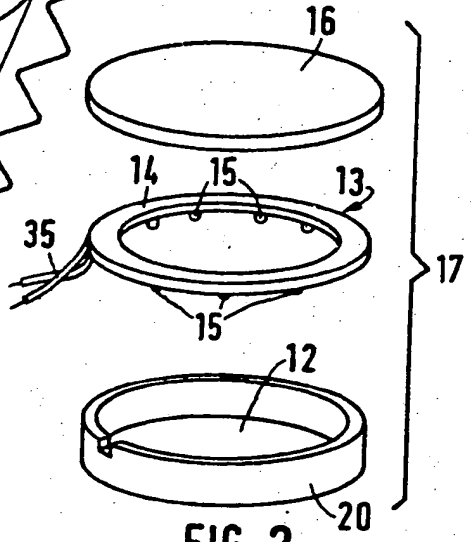


FIG. 2

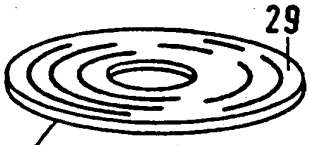


FIG. 3

SPECIFICATION
Photographic flash apparatus

The invention relates to a flash exposure device for a reproduction camera for screen recordings.

Reproduction cameras for producing screen modified images of an original copy for subsequent use in printing processes are well established in the art.

In one known arrangement (US-PS 4 185 914) the reproduction camera comprises, in the usual way, an objective lens spaced apart from a film holder located at the image plane of the objective lens with a light proof bellows extending between the film holder and the objective to prevent unwanted light reaching the photo sensitive material at the film holder.

A flash exposure source is arranged within the bellows closely adjacent to the edge of the film holder around the border of the image plane. Light from the flash exposure source is directed toward the bellows so that only scattered light, which is thus evenly distributed, is received at the image plane. With this arrangement flash exposure can take place simultaneously with main exposure. the uniformity of the illumination which can be achieved with this arrangement over the whole area of the image plane is of outstanding quality. The known flash exposure device has been specially developed for high contrast photo sensitive material which simultaneously lies with the photo sensitive layer directly against the screen.

In another branch of graphics photo sensitive materials with less pronounced contrast are however used for screening. The film material is sometimes also subjected to flash exposure through the backing layer. This signifies that one has to operate with directed light.

In this connection processes are known which, by way of example, operate with lamps mounted at a sufficient distance from the copying surface or, with lamps which are pivoted in front of the objective. The known systems have however the disadvantage that a drop-off of illumination towards the sides is not compensated for which leads to irregular illumination of the photo sensitive material, in particular with more modern wide angle objectives. Such novel wide angle objectives are however a prerequisite for making larger screen recordings.

Moreover, it is difficult to automate the entire recording and flash exposure cycle.

The object underlying the present invention thus resides in the provision of a flash exposure device of the initially named kind by means of which it is possible to obtain a very uniform flash exposure which simultaneously also takes account of the fall-off in illumination towards the edges, in particular with wide angle objectives. The flash xposure field should therefore not exhibit any structure.

In order to accomplish these objects there is provided, in accordance with the present invention, a flash exposure source for use with a reproduction camera for screen recordings, said reproduction camera comprising an objective, in particular a wide angle objective, a film holder arranged spaced therefrom and a flash exposure source which is positionable near the objective on the side of the objective remote from the film holder in order to be able to carry out flash exposure through the objective of photo sensitive material located at the film holder, characterized in that the flash exposure source is of substantially round construction, is positionable concentric to the objective and has a light intensity which progressively reduces towards the centre.

The progressive reduction of the light intensity towards the centre is so selected for this arrangement, taking account of the drop-off in illumination produced by the wide angle objective that is used, that a uniform illumination of the screen is ensured. It is important in this connection that the flash exposure source is arranged in front of the objective in such a way that the objective still exerts a degree of optical mapping so that the light from the central regions of the flash exposure source generally reaches the inner regions of the photo sensitive material whereas the more intense light leaving the marginal regions of the flash exposure source reaches the marginal regions of the photo sensitive material. As this arrangement does not produce accurate imaging of the priming exposure source, but instead very unsharp imaging, a continuous uniform transition of the light intensity from the inner regions to the outer regions of the photo sensitive material is ensured. Excellent uniformity of the intensity of the flash exposure on the film sensitive material is thus achieved despite the increase in light towards the outer regions of the photo sensitive material.

The subclaims define advantageous constructional embodiments of the flash exposure device of the invention.

In particular, the features of claim 10 ensure that disturbances of the uniformity of the flash exposure source are not brought about by any form of fitting. The features of claims 11 and 12 promote the uniformity of the flash exposure significantly.

In the embodiment of claim 15 the edges of the cylindrical cup are intended to diffusely scatter light at their inner surfaces. Both the scattering surface and the cylindrical inner walls of the cup are preferably white.

In the embodiment of claim 17 it is particularly advantageous that a filter wheel, which is in any case present in reproduction cameras of this kind, can also be used to support the flash exposure source of the invention.

The invention will now be described in the following by way of example and with reference to the drawing which shows:

Fig. 1 a schematic perspective view of a reproduction camera in accordance with the invention in the area between the film holder and the filter wheel,

Fig. 2 an enlarged perspective view of a preferred embodiment of the flash exposure source used in the flash exposure device of the invention with the source shown in exploded view and

Fig. 3 a perspective view of a sliding contact plate used with a filter wheel of Fig. 1.

In the drawing a light tight bellows 22 is arranged between the film holder 21 of a reproduction camera and the objective 11. The light tight bellows 22 prevents light, other than that passing through the objective 11, from falling on the lower side of the film holder 21 which receives the photo sensitive material. The beam path for the formation of an image on the photo sensitive material at the film holder 21 from the original copy 23, which is only indicated in broken lin s, is schematically indicated at 24. Different size enlargements can be realized by varying the distance of the original copy 23 from the objective 11 or of the objective 11 from the film holder 21.

In accordance with the invention a filter wheel 19, the rotational axis 25 of which is parallel to and laterally displaced relative to the optical axis 24 of the reproduction camera, is arranged directly beneath the objective 11. The filter wheel 19 is journalled on a vertical shaft 26 (shown withdrawn in an upward direction) in such a way that it can be easily removed axially for maintenance purposes, or to exchange filters or the flash exposure source 17 of the invention, after withdrawing a clip 27 arranged in a groove 28. A slide contact plate 29 which is shown separately and in enlarged form in Fig. 3 is arranged concentrically on the filter wheel 19. The slide contact plate 29 supplies current to the flash exposure source 17 of the invention which still has to be described and simultaneously enables the position of the filter wheel 19 to be displayed via control lamps or a computer on rotation of the same. The filter wheel, including the slide contact plate which is rotationally fixed thereto can be positioned both by hand and also by an electric motor via a computer.

Six openings 18, 30, 31, 32, 33, 34 are arranged uniformly spaced around the periphery of the filter wheel. Of the preferably round, openings 30 to 34 one is open in order to allow light to pass unhindered from the original copy 23 to the objective 11. Filters are located in the remaining four openings. The flash exposure source 17 of the invention which is shown in detail in Fig. 2 is arranged in the opening 18. A cup 20 with a right cylindrical wall and a circular base has a surface 12 on the inner side of its base which diffusely scatters light. The cylindrical inner wall of the cup 20 is also preferably coated with material which diffusely scatters light. An illuminated ring 13 is inserted into the cup 20 from the open side. The illuminated ring 13 consists of an annular plate 14 with a plurality of miniature bulbs 15 arranged at uniform spacings on the side of the annular plate facing the surface 12. Cables 35 lead from the annular plate 14 through a radial groove 36 (Fig. 1) to the slide contact board 29 which enables the supply of electrical power.

The annular plate 14 is shielded at its side remote from the miniature bulbs 15 by a diffusor of milk glass.

In the assembled condition the diffusor 16, the illuminated ring 13 and the cup 20 form an extremely shallow flash exposure source 17 which is housed in the opening 18 of the filter wheel 19. This flash exposure source 17 exhibits, as a result of the construction in accordance with the invention, a light intensity which reduces progressively towards the centre. When imaging the original copy the reduction in light required towards the sides when using a wide angle objective 11 is achieved by differential illumination of the original copy 23.

As a result of the construction of the invention it is possible to limit the axial height of the flash exposure source 17 to a value as low as 1.5cm. The flash exposure source 17 delivers a very intense light which simultaneously reduces progressively and uniformly in intensity towards the centre. The progressive reduction of light can be varied in simple manner by changing the spacing of the annular board 14 from the base surface 12 of the cup 20.

As the flash exposure source 17 sits in front of the objective 11 it generates at the location of the photo sensitive material at the film holder 21 a very uniform but nevertheless directed light.

As a result of the arrangement of the flash exposure source 17 in the pivotable filter wheel 19 the interchange between main and flash exposure can be readily and rapidly effected either by hand or by means of an electric motor.

The diameter of the illuminated ring is 8cm.

Claims

1. A flash exposure source for use with a reproduction camera for screen recordings, said reproduction camera comprising an objective, in particular a wide angle objective, a film holder arranged spaced therefrom and a flash exposure source which, is positionable near the objective on the side of the objective remote from the film holder in order to be able to carry out flash exposure through the objective of photo sensitive material located at the film holder, characterized in that the flash exposure source (17) is of substantially round construction, is positionable concentric to the objective (11) and has a light intensity which progressively reduces towards the centre.

2. A flash exposure source in accordance with claim 1 and characterized in that the flash exposure source (17) has a substantially round surface (12), which scatters light diffusely, which faces the objective (11) and which is illuminated in ring-like manner from the objective side.

3. A flash exposure source in accordance with claim 2 and characterized in that an illuminating ring (13) which only transmits light in the direction of the diffusely scattering surface (12)

but not however in the direction of the objective (11) is concentrically arranged at a small axial distance from the diffusely scattering surface (12).

4. A flash exposure source in accordance with claim 3 and characterized in that the illuminating ring (13) consists of an annular board (14) and a light source arrangement attached to the side of the board which faces the scattering surface (12).

5. A flash exposure source in accordance with claim 4 and characterized in that the light source arrangement consists of miniature bulbs (15) arranged with uniform spacing around the periphery of the annular board (14).

6. A flash exposure source in accordance with claim 5 and characterized in that from 10 to 14 and in particular 12 bulbs (15) are arranged around the periphery of the annular board (14).

7. A flash exposure source in accordance with claims 4 to 6 and characterized in that the axial spacing of the light source arrangement (15) from the diffusely scattering surface (12) amounts to from 6 to 15mm and in particular to approximately 8mm.

8. A flash exposure source in accordance with one of the preceding claims and characterized in that the spacing of the diffusely scattering surface (12) from the objective (11) amounts to from 1 to 10mm and in particular to approximately 3mm.

9. A flash exposure source in accordance with one of the preceding claims and characterized in that the diameter of the scattering surface (12) is substantially the same as the diameter of the image forming beam at the position at which the diffusely scattering surface (12) is introduced into the beam path.

10. A flash exposure source in accordance with one of the claims 4 to 9 and characterized in that no form of spacing supports or fastening means are arranged in the space between the light source arrangement (15) and the scattering surface (12).

11. A flash exposure source in accordance with one of the preceding claims and characterized in that a diffusor (16), in particular of milk glass, is arranged between the scattering surface (12) and the objective (11).

12. A flash exposure source in accordance with one of the claims 3 to 10 and 11 and characterized in that the diffusor (16) is arranged directly at the illuminating ring (13) at the side of the ring remote from the diffusely scattering surface (12).

13. A flash exposure source in accordance with claim 12 and characterized in that the spacing of the diffusor (16) from the scattering surface (12) amounts to from 12 to 21mm and in particular to approximately 14mm.

14. A flash exposure source in accordance with claim 12 or 13 and characterized in that the scattering surface (12), the illuminating ring (13) and the diffusor (16) are constructionally united into a round extremely shallow flash exposure source (17).

15. A flash exposure source in accordance with one of the preceding claims and characterized in that the scattering surface (12) is constructed at the base of a cylindrical cup (20) in which, or to which, the illuminating ring (13) and the diffusor (16) are, if required, also attached, preferably on annular steps.

16. A flash exposure source in accordance with one of the preceding claims and characterized in that the flash exposure source (17) can be pivoted in front of the objective (11).

17. A flash exposure source in accordance with claim 15 and characterized in that the flash exposure source (17) is arranged in an opening (18) of a filter wheel (19).

18. A reproduction camera incorporating a flash exposure source in accordance with one of the claims 1 to 17.

19. A flash exposure source substantially as herein described with reference to and as shown in the drawings.

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